

# 15-451 Mini 5

April 22, 2008

This mini is due via \*email\* to your TA, by midnight Tuesday April 29  
Please use the subject line "15-451 MINI #5" in your email.  
Questions/concerns/comments to Dafna Shahaf <dshahaf+451@cs.cmu.edu>

## 1 Question 1

1. What is  $5^{-1} \bmod 13$ ? (the multiplicative inverse of 5 in  $Z_{13}^*$ )
2. Give a number  $x$  whose order is 12 over  $Z_{13}^*$ , and write down the sequence of numbers  $1, x, x^2, x^3, \dots, x^{11} \bmod 13$ . (Such a number  $x$  is called a GENERATOR of  $Z_{13}^*$  since any element in  $Z_{13}^*$  can be written as a power of  $x$ ).
3. Give a number  $y$  whose order is 6 over  $Z_{13}^*$ , and write down the sequence of numbers  $1, y, y^2, y^3, y^4, y^5 \bmod 13$ .
4. Compute  $\text{GCD}(532, 113)$ .

## 2 Question 2

1. Give an equivalent 3-CNF for the following formula:

$$((x \text{ AND } y) \rightarrow z) \rightarrow (\neg z \rightarrow (\neg x \text{ OR } \neg y))$$

2. Is it satisfiable?
3. Is it a tautology? (every assignment satisfies it)
4. Is it a contradiction? (no assignment satisfies it)